REMARKS

Applicant has carefully reviewed and considered the Office Action mailed on March 11, 2004, and the references cited therewith.

Claims 3, 6, 9, 11, 16-18, 21, 23, 24, 27, 30, 31 and 33 have been amended, no claims have been added and no claims have been canceled. Thus, claims 3-35 are now pending in this application.

Interview Summary

Applicant conducted a telephone interview with the Examiner on February 17, 2004. In the interview, Applicant and Examiner discussed the prior art as it relates to the claims. No agreements were reached.

§112 Rejection of the Claims

Claims 3-35 were rejected under 35 USC §112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Applicant has amended claim 3 to provide antecedent basis for "the software" by identifying a region "of a software program" as suggested by the Office Action. Applicant has made similar amendments to claims 9, 16, 21, and 30.

Claims 3-35 were rejected under 35 USC §112 as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections.

Regarding claim 3, the Office Action suggested limiting the input registers to input data values of the region. Applicant has amended claim 3 to include "input registers <u>for storing input values of the candidate reuse region.</u>" (Emphasis added to show amendment.)

Claims 3-35 were rejected under 35 USC §112 as being incomplete for omitting essential steps, such as omission amounting to a gap between the steps.

To clarify steps, Applicant has amended claim 3 to include "instrumenting the software program to profile, when executed, set-values." (Emphasis added to show amendment.) Applicant has made similar amendments to claims 9, 16, 21 and 30.

Claims 23-26 were rejected under 35 USC §112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant has amended independent claim 23 to change "the location-values" to "the top set-values." Applicant submits that the amendment to claim 23 overcomes the rejections of dependent claims 24-26.

§102 Rejection of the Claims

Claim 11 was rejected under 35 USC §102(b) as being anticipated by Keller et al. (U.S. 5,355,487, hereinafter referred to as Keller). Applicant respectfully traverses this rejection because Keller does not anticipate the claimed invention, as set forth in amended independent claim 11.

Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration. *In re Dillon* 919 F.2d 688, 16 USPQ 2d 1897, 1908 (Fed. Cir. 1990) (en banc), cert. denied, 500 U.S. 904 (1991). It is not enough, however, that the prior art reference discloses all the claimed elements in isolation. Rather, "[a]nticipation requires the presence in a single prior reference disclosure of each and every element of the claimed invention, *arranged as in the claim.*" *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 221 USPQ 481, 485 (Fed. Cir. 1984) (citing *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 220 USPQ 193 (Fed. Cir. 1983)) (emphasis added).

Applicant respectfully submits that the Office Action did not make out a *prima facie* case of anticipation because the reference does not teach each and every element of the rejected claim.

Amended independent claim 11 recites "wherein the register values are input values of a software program region." Keller does not teach register values that are input values of a software program region. Moreover, Keller does not explicitly teach register values. If Keller's PID, SID and address (Keller Column 9, lines 11-31) were register values, they are not input

values of a software program region. As such, Applicant respectfully submits that Keller does

not teach each and every element of amended independent claim 11.

The Office Action indicates claims 16, 17, and 20-22 were rejected under 35 USC

§103(a) as being unpatentable over by Calder et al. ("Value Profiling and Optimization",

hereinafter referred to as Calder). Because the rejection appears under the 35 USC §102

heading, Applicant assumes the rejection is under "§102(a)" rather than "§103(a)."

Calder does not teach instrumenting the software to profile, <u>while executing</u> , as recited in

amended independent claim 16. Instead, Calder "allows an <u>instrumentation program to navigate</u>

<u>through</u> the basic blocks of <u>a program executable</u>, and collect information about registers used,

opcodes, branch conditions, and perform control-flow and data-flow analysis." (Emphasis

added.) Calder at page 11, last paragraph. Additionally, as recited in amended independent

claim 16, Calder does not <u>sample a location-value</u> every S occurrences of the candidate load

instruction. Instead Calder <u>first</u> "generates a profile which contains the <u>address</u>, and <u>number of</u>

<u>times</u> each memory location was accessed." (Emphasis added.) Calder at Page 20, first full

paragraph. <u>Later</u>, Calder <u>value</u> profiles the results of the first profile. Therefore, Calder first

tracks <u>every</u> memory <u>location</u> access, and then <u>separately</u> tracks the value of the memory

location. Calder's technique is not sampling, as claimed. As such, Applicant respectfully

submits that Calder does not teach each and every element of amended independent claim 16.

Regarding amended independent claim 21, as discussed above, Calder does not teach

"instrumenting the software to, upon <u>execution, sample</u> a location value-every S occurrences of

the candidate load instruction." (Emphasis added). As such, Applicant respectfully submits that

Calder does not teach each and every element of amended independent claim 21.

Regarding dependent claims 17 and 22, Calder does not teach "inserting instructions in

the software program to count a number of times the location-value is sampled." Calder teaches

two ways for inserting instructions into the software. First, when Calder discusses Gallagher et

al., it calls for inserting a check instruction to allow load instructions to speculatively execute

before store instructions. Second, when Calder discusses Fu et al., it calls for inserting an add

instruction which provides the predicted value of a specified load instruction. See Calder at page

3, Section 2.2. Neither of these insertions are for counting a number of times a location-value is

sampled. Instead, both of these insertions are for speculating about the value of a load
instruction.

Regarding claim 20, as similarly discussed above, Calder does not teach "inserting
instructions in the software program to keep track of top location-values."

For the reasons noted above, Calder does not teach or suggest all the limitations of
dependent claims 16, 17, and 20-22.

The Office Action indicates claims 23 and 27 were rejected under 35 USC § 103(a) as
being unpatentable over by Connors et al. ("Compiler-Directed Dynamic Computation Reuse:
Rationale and Initial Results," hereinafter referred to as Connors). Because the rejection appears
under the 35 USC §102 heading, Applicant assumes the rejection is under "§102(a)" rather than
"§103(a)."

Amended independent claim 23 recites "the selecting including, ... storing an occurrence
frequency of the top set-values into a data structure." (Emphasis added.) Connors' storing occurs
after the reuse region has already been selected, but not as part of the selecting. As shown in
Connors, "the structure consists of an array of entries..." "An entry supports the reuse for a
particular compiler specified region." (Emphasis added.) Connors at page 162, section 3.1. As
such, Applicant respectfully submits that Connors does not teach each and every element of
amended independent claim 23.

Amended independent claim 27 recites "wherein the profiling occurs during execution of
the software program." As noted above, Connor's profiling does not occur during the execution
of the software program, but rather a separate "instrumenting" program navigates through the
executable to perform the profiling. As such, Applicant respectfully submits that Connors does
not teach each and every element of amended independent claim 27.

§103 Rejection of the Claims

Claims 3, 5-10, 12, 14, 15, 30, 31, 33 and 35 were rejected under 35 USC §103(a) as
being unpatentable over Connors in view of Feller et al. ("Value Profiling", hereinafter referred
to as Feller) and in further view of Keller. Applicant respectfully traverses this rejection because

the Office Action has not established a *prima facie* case of obviousness regarding the rejected
claims.

The Examiner has the burden under 35 U.S.C. §103 to establish a *prima facie* case of
obviousness. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). To do
that the Examiner must show that some objective teaching in the prior art or some knowledge
generally available to one of ordinary skill in the art would lead an individual to combine the
relevant teaching of the references. *Id.*

The *Fine* court stated that:

> Obviousness is tested by "what the combined teaching of the references would
> have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413,
> 425, 208 USPQ 871, 878 (CCPA 1981)). But it "cannot be established by
> combining the teachings of the prior art to produce the claimed invention, absent
> some teaching or suggestion supporting the combination." *ACS Hosp. Sys.*, 732
> F.2d at 1577, 221 USPQ at 933. And "teachings of references can be combined
> *only* if there is some suggestion or incentive to do so." *Id.* (emphasis in original).

The M.P.E.P. adopts this line of reasoning, stating that

> In order for the Examiner to establish a *prima facie* case of obviousness, three
> base criteria must be met. First, there must be some suggestion or motivation,
> either in the references themselves or in the knowledge generally available to one
> of ordinary skill in the art, to modify the reference or to combine reference
> teachings. Second, there must be a reasonable expectation of success. Finally,
> the prior art reference (or references when combined) must teach or suggest all
> the claim limitations. The teaching or suggestion to make the claimed
> combination and the reasonable expectation of success must both be found in the
> prior art, and not based on applicant's disclosure. *M.P.E.P.* § 2142 (citing *In re
> Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed.Cir. 1991)).

The Office Action has not provided proper teaching or suggestion to combine the cited
references. The Office Action asserts that it would have been obvious to one skilled in the art at
the time of the invention to implement the profiling system of Connors with combining register
values into a single value as suggested by Keller's teaching. However, Connors would not have
combined input register values because Connors teaches "at compile time, the mapping relation
between the single input register and single output register may be determined." (Emphasis
added.) Connors at page 160, right column. Connors uses this information to construct an

alternative flow graph that would not work by combining the input registers into a single value. As such, Connors teaches away from using the techniques of Keller. Moreover, even if the combination were proper, the combination does not teach or suggest all the elements of the rejected claims.

Amended independent claim 3 recites "instrumenting the software program to, when executed, profile set-values for the input set, wherein each set-value comprises an input register value for each of the plurality of input registers." Connors' profiling does not occur during execution. Instead, Connors' profiling "requires some estimation of the run-time behavior of a program." Connors at page 162, Section 4.2, first sentence. For the combination to teach or suggest each and every element of amended independent claim 3, Feller or Keller must teach or suggest this limitation. Feller does not teach or suggest instrumenting a program. Instead Feller uses "an instrumentation program to navigate through the basic blocks of a program executable." Feller at Page 262, right column, first sentence. Keller does not teach or suggest instrumenting the software program. Instead, Keller teaches a "non-invasive profiling." Neither Connors, Feller, nor Keller, alone or in combination, teach or suggest instrumenting the software so that when it executes, it will profile set values for the input-set. As such, applicant submits that the cited combination does not teach or suggest every element of claim 3.

Independent claims 9 and 30 similarly recite "instrumenting the software... when executed." Applicant submits that claims 9 and 30 are allowable for at least the reasons given vis-à-vis claim 3.

Dependent claims 5-8, 10, and 31 depend directly or indirectly on claims 3, 9, and 30. Applicant submits that the rejected dependent claims 5-8, 10, and 31 are allowable for the reasons discussed above vis-à-vis claims 3, 9, and 30.

Regarding dependent claim 12, which depends on independent claim 11, as discussed above, (see §102 discussion above) Keller does not teach "register values that are input values of a software program region." Feller and Connors do not teach or suggest what Keller is lacking. Therefore the combination does not teach or suggest all the elements of claim 12.

Claims 14 and 15 depend from dependent claim 12 and are allowable for the same reasons, plus the elements of the claims.

Claims 33 and 35 recite "register values" that "input values of the candidate reuse region." As similarly discussed above vis-à-vis claim 11, the cited combination does not teach this limitation. For the reasons given above, plus the elements of the claims, Applicant submits that claims 33 and 35 are patentable over the cited combination.

Claims 4 and 32 were rejected under 35 USC §103(a) as being unpatentable over Connors in view of Feller, in further view of Keller, and in further view of "Dictionary of Computing" (hereinafter referred to as Dictionary). As discussed above, Connors, Feller, and Keller do not teach or suggest limitations for instrumenting the software so that profiling occurs when the software program executes, nor do they teach limitations for combining register values. For the combination to teach or suggest each and every element of the claims, Dictionary must teach or suggest what the other references are lacking. The Office Action cited no passage in the Dictionary that teaches or suggests the above noted limitations. As such, Applicant respectfully submits that the combination does not teach or suggest each and every element of dependent claims 4 and 32.

Claims 13 and 34 were rejected under 35 USC §103(a) as being unpatentable over Connors in view of Feller, in further view of Keller, and in further view of Chang (U.S. 5,933,628, hereinafter referred to as Chang.) Claims 13 and 34 depend directly or indirectly on claims 11 or 33. Claims 13 and 34 are allowable for at least the reasons discussed above vis-à-vis claims 11 and 33.

Claims 18 and 19 were rejected under 35 USC §103(a) as being unpatentable over Calder in view of Chang. Dependent claims 18 and 19 depend directly or indirectly on amended indepenent claim 16. As noted above, Calder does not teach or suggest all the limitations of claim 16. Chang does not provide what Calder is lacking. As such, the combination does not teach or suggest each and every element of claims 18 and 19.

Claims 24-26 and 28 were rejected under 35 USC § 103(a) as being unpatentable over Connors in view of Keller. Rejected dependent claims 24, 26 and 28 each include a limitation for storing an occurrence frequency of the top set-values into a data structure. As discussed above, Connors does not teach storing as part of selecting a reuse region. The Office Action has not cited a passage from Keller that teaches the limitation noted above; therefore, Applicant

respectfully submits that the combination does not teach or suggest each and every element of claims 24-26 and 28.

Claim 29 was rejected under 35 USC §103(a) as being unpatentable over Connors in view of Feller. Rejected dependent 29 includes a limitation for storing an occurrence frequency of the top set-values into a data structure. As discussed above, Connors does not teach this limitation. The Office Action has not cited a passage from Feller that teaches the limitation noted above; therefore, Applicant respectfully submits that the combination does not teach or suggest each and every element of claim 29.

Reservation of Rights

Applicant does not admit that references cited under 35 U.S.C. §§ 102(a), 102(e), 103/102(a), or 103/102(e) are prior art, and reserves the right to swear behind them at a later date. Arguments presented to distinguish such references should not be construed as admissions that the references are prior art.

AMENDMENT AND RESPONSE UNDER 37 CFR § 1.111
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Conclusion

Based on the foregoing, Applicant respectfully requests that the rejections be withdrawn. Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612) 371-2169 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop Amendment, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this __11th__ day of May, 2004.

___KACIA LEE___   ___Kacia Lee___

Name   Signature